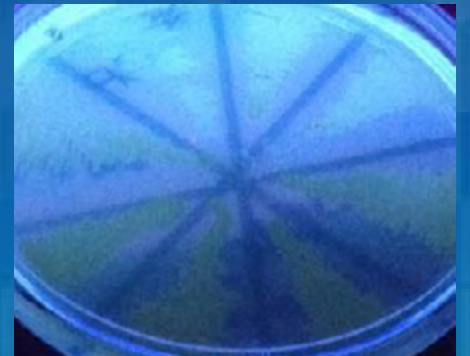


# THE iGEM TEAM HANDBOOK



 **VIRTUS PARVA**



## FOREWORD

WORKING WITH THE HANDBOOKS BECAME AN INSPIRING PIECE OF WORK. BECAUSE THE WORK PUT INTO THEM WAS, PRIMARILY, IN ORDER TO HELP AND ASSESS NEW TEAMS AND EXPERIENCED ONES AS WELL. SEVERAL PARTS BECAME INVOLVED IN THE CREATION OF THESE MATERIALS, AS THE ORIGINAL HOLDERS OF THE IDEA, THE ITESM CAMPUS CEM TEAM KNOWING THIS WOULD NOT BE AN EASY WALK, SOUGHT CO-AUTHORSHIP. THAT'S WHEN THE VIRTUS PARVA TEAM DECIDED TO BECOME INVOLVED AND HELP EACH OTHER OUT. THERE ARE THREE HANDBOOKS, EACH, WITH A SPECIFIC AREA: THE GOOD LABORATORY PRACTICE HANDBOOK, WHICH HELPS ON SETTING THE STANDARDS OF THE WORK DONE IN THE LABORATORY; THE iGEM REGISTRY HANDBOOK, WHICH IS AN EASY TO FOLLOW STEP GUIDE FOR ALL THOSE WHO VENTURE INTO THE iGEM PARTS DOMAIN, IT COVERS FROM LOOKING UP A STANDARD PART INTO ADDING YOUR OWN, GOING THROUGH THE SENDING OF A PART FOR SEQUENCING AND THE SHIPPING PROCESS; AND LAST BUT NOT LEAST, THE iGEM TEAM HANDBOOK, THIS ONE HOPES TO COVER MOST OF THE TEAM FORMATION PROCESS, AS WELL TO BE A GUIDELINE FOR TEAMS TO FOLLOW ALONG THE PROCESS UNTIL THE JAMBOREE IS CONCLUDED. THIS WORK WAS THE MOST COMPLEX TO RESOLVE, STILL, SOME TEAMS MAY NOT FIND IT INSIGHTFUL SINCE THERE ARE MANY WAYS A TEAM RESPONDS AND STAYS MOTIVATED.

THIS IS AN UNCONVENTIONAL HANDBOOK, STILL, IT WILL TRY ITS BEST TO COVER THE ENTIRE iGEM PROCESS FROM THE DAY AN IDEA IS CONCEIVED TO THE DAY THE JAMBOREE FINDS ITS CONCLUSION. 10 YEARS OF iGEM, AND IT KEEPS TO CONTINUALLY RE-NEW ITSELF; NEW TRACKS, NEW RULES, EVEN THE GIANT JAMBOREE SUMMONING IS NEW! THE PURPOSE OF THIS GUIDE IS TO AID NEWCOMERS AND VETERANS ALIKE, SO THEY CAN REVIEW EVERY STEP AND PROCURING NOT TO MISS ANY IMPORTANT, AND EVEN NOT SO MUCH, DATES.

IT IS IN OUR BEST OF HOPES, THAT FUTURE GENERATIONS OF iGEM PARTICIPATING TEAMS KEEP UPDATING THIS PIECE OF MATERIAL. FOR IT IS A CONTRIBUTION WE HAND UNTO THE YOUNGER GENERATIONS OF EAGER MINDS HUNGRY TO REINVENT THE WORLD. I WILL NOT FAZE YOU WITH NON-IMPORTANT GIBBERISH, GO AHEAD AND DISCOVER WHAT iGEM HOLDS FOR YOU AND THE WORLD.

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## 1. THE CONCEPTION

H.G. WELLS ONCE SAID "HUMAN HISTORY IS, IN ESSENCE, A HISTORY OF IDEAS". WELCOME TO THE INTERNATIONAL GENETICALLY ENGINEERED MACHINES (iGEM) COMPETITION! A PLACE WHERE THE IDEAS OF A SINGLE CAN MAKE THE WORLD STEER INTO A DIRECTION IT NEVER THOUGHT IT WOULD.

### 1.1 WHAT IS iGEM?

iGEM, AS STATED ABOVE, IS AN INTERNATIONALLY RENOWNED CONVENTION HELD YEARLY IN THE HEART OF THE CITY OF BOSTON, MA. ONE OF THE OLDEST CITIES IN NORTH AMERICA, AND TOO, ONE OF ITS HISTORY'S MOST PRIZED JEWELS.

iGEM FOCUSES, PRIMARILY, ON THE DIFFUSION OF SCIENTIFIC KNOWLEDGE IN THE BRANCH OF SYNTHETIC BIOLOGY. WHICH IN TURN, ACCORDING TO [WWW.SYNTHETICBIOLOGY.ORG](http://WWW.SYNTHETICBIOLOGY.ORG), IS THE DESIGN AND CONSTRUCTION OF NEW BIOLOGICAL PARTS, DEVICES AND SYSTEMS, AND THE REDESIGN OF EXISTING, NATURAL BIOLOGICAL SYSTEMS FOR USEFUL PURPOSES. ALL IN ALL, SYN BIO'S MAIN GOAL IS THE APPLICATION OF ENGINEERING PRINCIPLES INTO BIOLOGICAL ENTITIES.

NOW, WHAT ARE iGEM'S OBJECTIVES? CONSIDERING THAT IN THE YEAR OF 2014, THEY MANAGED TO REACH A RECORD HIGH 246 TEAMS REGISTERED AND MORE THAN 3,000 STUDENTS AND INSTRUCTORS WORKING ON THEIR PROJECTS, THEY MUST HAVE A CLEAR IDEA OF WHAT THEY'RE LOOKING TO ACHIEVE. THE MAIN GOAL OF iGEM IS TO FOSTER THE DEVELOPMENT OF SYNTHETIC BIOLOGY THROUGH AN UNDERGRADUATE COMPETITION. COMPETITION THAT HAS NOW HAD TO REFORMAT TO INCLUDE ALSO HIGH SCHOOL (IN THEIR OWN JAMBOREE) AND GRADUATE TEAMS.

### 1.2 YOU HAVE TO WORK, IN TEAMS.

YES, MANY PEOPLE DREAD THE WORD "TEAMWORK" BECAUSE WHEN IN ASSIGNMENTS NOT EVERYONE WORKS AS A TEAM. BUT, HERE'S THE FUN PART, THIS TIME YOU GET TO CHOOSE WHO YOU WILL WANT TO BE WORKING FOR THE TEAM. NOW, iGEM IS A BIOTECHNOLOGICAL COMPETITION, YET, THAT DOES NOT EXCLUDE PEOPLE FROM OTHER AREAS OUTSIDE OF ENGINEERING AND SCIENCES TO BE COLLABORATING IN THE WORK. THEY MIGHT NOT BE INVOLVED IN THE LABORATORY WORK AS DIRECTLY, STILL, THEY CAN PROVIDE KNOWLEDGE FOR MARKETING, DESIGN, ITS, PUBLIC RELATIONS, HECK, EVEN PERFORM AN ENSEMBLE DURING THE PRESENTATION (FOR MORE ON THIS, LOOK UP ON YOUTUBE FOR THE QUEEN'S 2012 TEAM PRESENTATION. QUEENS, IF YOU'RE READING THIS, YOU GUYS ARE AWESOME!).

#### 1.2.1 RECRUITMENT

THE RECRUITING PROCESS VARIES GREATLY. A TEAM CAN SELF-ASSEMBLE FROM A GROUP OF FRIENDS, OR IT CAN ALSO BE BORN AFTER A RECRUITING PROCESS. TIMING IS OF THE UTMOST IMPORTANCE AT iGEM, AND HAVING YOUR TEAM MOSTLY COMPOSED BY JANUARY, EARLY FEBRUARY OF THE YEAR OF PLANNED COMPETITION WILL BE A GREAT FIRST STEP.

THERE WILL BE TIMES WHEN, SUBMITTERS WILL FLOCK AT YOUR DOOR, AND AN ELABORATE RECRUITMENT MUST BEGIN, EVEN HAVING TWO TEAMS EMERGING FROM THE INSTITUTION WILL BE CONSIDERED. OTHERS, WHERE THE STRUGGLE OF FINDING PARTNERS IS ALMOST UNBEARABLE (IN SITUATIONS LIKE THESE, ONE

CAN ALWAYS LINK UP WITH OTHER INSTITUTIONS). IN ANY OF THESE, KEEP IN MIND, THAT TRAITS SUCH AS PRESSURE MANAGEMENT, INNOVATION, INITIATIVE AND INGENUITY MUST BE CONSIDERED MORE THAN GOOD GRADES AND EXPERIENCE.

BY ALL MEANS, A BRIEF YET CONCISE QUESTIONNAIRE PRESENTED TO THE SUBMITTER CAN BECOME BIG HELP IN THE SELECTION PROCESS:

- iGEM TEAM APPLICATION -

NAME (LAST, FIRST):

E-MAIL ADDRESS:

PHONE:

YEAR/PROGRAM:

GPA FROM TWO MOST RECENT TERMS:

RELEVANT COURSE EXPERIENCE:

CAREER/EDUCATION ASPIRATIONS:

WHY YOU WANT TO PARTICIPATE IN iGEM:

WHY YOU THINK YOU WOULD MAKE A GOOD iGEM TEAM MEMBER:

WHAT YOU WANT TO MAKE OR DO WITH THIS TECHNOLOGY:

### 1.2.2 FULL-TIME, PART-TIME, VOLUNTEER OR PAID?

ONE OF THE MAIN ISSUES IN FORMULATING THE TEAM IS WHAT WILL IT BE CONSTITUTED FROM. FULL-TIME MEMBERS COMPOSE THE MAJORITY OF TEAMS, AND THEY ARE MOST PRONE TO WORK THAN PART-TIME MEMBERS. TAKE NOTICE THAT HAVING GROUPS OF FULL-TIME AND PART-TIME STUDENTS CAN LEAD TO RESENTMENTS AND SLOW DOWN PROGRESS. ON THE OTHER HAND, PAID ONLY TEAM MEMBERS IS OUT OF THE EQUATION FOR MOST INSTITUTIONS.

MEMBERS SHOULD FIND A BALANCE IN BETWEEN GENDERS. AS WELL, IT MIGHT BE OF GOOD CONSIDERATION TO ADD TWO OR THREE SECOND YEAR STUDENTS, WHOSE TASK WILL BE TO LEARN OF THE iGEM WAYS AND SYNTHETIC BIOLOGY IF THE MAJORITY OF THE TEAM IS COMPOSED OF SENIOR STUDENTS.

THE NUMBER OF MEMBERS IS OF LESSER CONCERN, REALLY.

A TEAM CAN BE COMPOSED FROM THREE OR FOUR GUYS, TO TWENTY PLUS; YES, IT CAN GET CROWDED. THE GREATEST PART OF IT ALL, IS THAT, UNCONSCIOUS OR CONSCIOUSLY, YOU ARE DEVELOPING IN A MULTIDISCIPLINARY ENVIRONMENT, A COMPETENCE THAT IS FAR OFF WELL SOUGHT BY EMPLOYERS. AND THE FACT THAT YOU CAN GET CLOSER WITH YOUR TEAMMATES.

### 1.2.3 TEAM CONSENSUS AND WORK POLICIES

iGEM PARTICIPATION IS A PRIVILEGE, AN HONOR, A CHALLENGE AND A JOYOUS CELEBRATION OF SCIENCE AND ENGINEERING, AND FOR THAT, COMMITMENT TO THE CAUSE SHOULD BE HELD. THIS, IS AN EXAMPLE OF A GUIDELINE THAT MIGHT ASSURE A GOOD WORK ETHIC AMONGST THE TEAM MEMBERS AND ADVISORS AS WELL. IT READS AS FOLLOWS:

STUDENTS:

- TO COMMIT OUR INTELLECT AND ENERGIES TO THE FULFILLMENT OF THE TEAM GOALS.
- TO LEARN THE PRINCIPLES OF SYNTHETIC BIOLOGY AND THE SCIENCE BEHIND OUR PROJECT
- TO CONDUCT OURSELVES AND OUR RESEARCH TO THE HIGHEST SCIENTIFIC AND ETHICAL STANDARDS
- TO REPRESENT THE IDEALS OF SYNTHETIC BIOLOGY AND iGEM IN A FAIR, BALANCED AND OPEN MANNER TO THE GENERAL PUBLIC
- TO WORK A MINIMUM OF XXX WEEKLY VOLUNTEER HOURS DURING THE PROJECT PLANNING PHASE
- TO ATTEND A FULL WEEKEND BASIC MOLECULAR BIOLOGY COURSE HELD <DATES>
- TO WORK A MINIMUM OF XXX WEEKLY VOLUNTEER HOURS DURING THE PROJECT EXECUTION PHASE



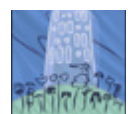


- TO WORK A MINIMUM OF XXX WEEKLY VOLUNTEER HOURS DURING THE JAMBOREE PREPARATION PHASE
  - TO ATTEND ALL GROUP MEETINGS AND LEARNING SESSIONS OR TO NOTIFY COORDINATORS IF IMPOSSIBLE
  - TO TRAVEL TO THE JAMBOREE (AND OTHER LOCAL EVENTS) AND PARTICIPATE JOYFULLY
  - TO WORK HARD, LEARN LOTS AND HAVE FUN
- INSTRUCTORS/ADVISORS:
- TO COMMIT OUR INTELLECT AND ENERGIES TO THE FULFILLMENT OF THE TEAM GOALS
  - TO LEARN AND TEACH THE PRINCIPLES OF SYNTHETIC BIOLOGY AND THE SCIENCE BEHIND OUR PROJECT
  - TO TRAIN STUDENTS IN ALL THE SKILLS AND TECHNIQUES REQUIRED IN THE PROJECT OR TO FIND SUITABLE INSTRUCTORS, WHERE REQUIRED
  - TO CONDUCT OURSELVES AND OUR RESEARCH TO THE HIGHEST SCIENTIFIC AND ETHICAL STANDARDS
  - TO REPRESENT THE IDEALS OF SYNTHETIC BIOLOGY AND iGEM IN A FAIR, BALANCED AND OPEN MANNER TO THE GENERAL PUBLIC
  - TO WORK A MINIMUM OF XXX WEEKLY VOLUNTEER HOURS THROUGHOUT THE PROJECT
  - TO ATTEND ALL GROUP MEETINGS AND LEARNING SESSIONS OR TO NOTIFY COORDINATORS IF IMPOSSIBLE
  - TO TRAVEL TO THE JAMBOREE (AND OTHER LOCAL EVENTS) AND PARTICIPATE JOYFULLY
  - TO WORK HARD, TEACH/LEARN LOTS AND HAVE FUN.

HEALTHY TEAMS TOO, HOLD SESSIONS IN MORE SOCIAL ENVIRONMENTS TO HELP BUILD INTERACTIONS AND TRUST. THE WORK ENVIRONMENT HAS TO BE COMMUNICATION RICH, DIFFICULT TASK TO ACHIEVE WITH A YOUNG GROUP. ESTABLISH STANDARDS FOR DOCUMENTATION AND ENCOURAGE TEAM MEMBERS TO SHARE THEIR RESULTS, PROBLEMS AND THOUGHTS AMONG EACH OTHER AND WITH THEIR ADVISORS. OPERATING A JOURNAL CLUB WHERE TEAM MEMBERS READ AND DISCUSS A SINGLE PAPER CAN HELP FACILITATE THIS, DEPENDING ON THE TIME AVAILABLE. ALSO, PROJECT MILESTONES AND DEADLINES CAN HELP HEIGHTEN THE SENSE OF URGENCY AND ADVENTURE, WHICH WILL OFTEN HELP TEAMS TO COALESCE. GLADLY, THE RESPONSIBILITY OF THE TEAM DOES NOT BEFALL ON ONLY ONE LEADER, BUT, A GOOD iGEM TEAM IS COMPRISED OF MULTIPLE LEADERS, EACH INDEPENDENT AND DESIRING TO ACCOMPLISH THE TEAM'S GOALS.

### 1.3 IDEAS MAKE THE WORLD GO ROUND

AS OBVIOUS AS IT SOUNDS, STUDENTS MUST APPROACH TO A SYNTHETIC BIOLOGY COURSE WITHIN THEIR INSTITUTIONS. NEVERTHELESS, NOT EVERY SCHOOL OFFERS ONE, SO, A GOOD ALTERNATIVE WOULD BE TO READ LITERATURE ABOUT IT, GATHER IN MEETINGS AND DISCUSS REGARDING THE PRINCIPLES OF SYN BIO. MUCH CAN BE FOUND ONLINE: CONFERENCES, JOURNAL REVIEWS, EVEN REVIEWING PREVIOUS iGEM COMPETITORS' PROJECTS AIDS AS A MEANS TO LEARN ABOUT SYN BIO. THE WHOLE iGEM PROCESS RELIES ON THE POWER OF THE IDEA. AN IDEA THAT CAN BE AS REVOLUTIONARY TO SCIENCE, AS IT CAN BE DELUSIONAL. iGEM'S FOCUS IS TO GENERATE CONVICTION WITHIN THE TEAMS FOR THEIR IDEAS, AND TO SEE THAT IT WOULD TAKE OFF AND BECOME PART OF THE LANDSCAPE. THE IDEA PROCESS MOST COMMONLY BEGINS BY BRAINSTORMING, IF YOU FIND YOURSELF SHORT ON THAT IDEA BRINGING RESOURCE, BET FOR THE WITTY GUYS IN YOUR CLASSROOM, THEY BRIM WITH IDEAS.



THE IDEA YOUR TEAM AGREES ON, MUST BE SOMEWHAT ACHIEVABLE, SOMETIMES THAT IS NOT TOO POSSIBLE IF THERE IS A LACK OF TECHNOLOGY IN THE FIELD, BUT AN ADVANCE CAN BE SET. BE SURE THAT THE IDEA THE TEAM AGREES ON CONTAIN ELEMENTS OF MATHEMATICAL MODELING OR SIMULATION, MOLECULAR BIOLOGY, ASSAYS OF RESULTS (INSTRUMENTATION DEVELOPMENT WOULD BE A GOOD FIT) AND THOUGHTFUL EXAMINATIONS REGARDING EEELS (ETHICAL, ENVIRONMENTAL, ECONOMIC, LEGAL AND SOCIAL) ISSUES.

BASED ON THE APPROACH OF YOUR IDEA, YOU CAN NOW BEGIN TO LOOK UP FOR INSTRUCTORS AND ADVISORS THAT WILL GUIDE YOU THROUGH. BY DEFINITION, iGEM TEAMS ARE COMPOSED MAINLY OF UNDERGRADUATE STUDENTS (HIGH SCHOOLERS CAN ROLL TOO IF THEY'RE COOL ENOUGH), PhD STUDENTS, RESEARCH ASSOCIATES, PROFESSORS AND OTHER FACULTY ARE CONSIDERED TO BE ADVISORS OR TEAM INSTRUCTORS, WHOSE ROLE IS TO BE PRIMARILY INSTRUCTIONAL.

#### 1.3.1 CHOOSING THE ADEQUATE ADVISORS

HERE LIES ANOTHER PILLAR OF THE PROCESS. IN ORDER TO ACHIEVE GREAT RESULTS, YOU'LL NEED GREAT ADVISING, AND MOST OF IT COMES FROM NO OTHER THAN YOUR VERY OWN FACULTY PROFESSORS. WHY, YOU ASK? FIRST OF ALL, EACH HAS A SPECIFIC FOCUS IN THEIR OWN FIELD, AND IN THAT PARTICULAR SENSE YOUR TEAM WILL BE ABLE TO HARNESS TO GREAT EXTENTS THAT KNOWLEDGE, BE IT MOLECULAR BIOLOGY, PLANTS BIOLOGY, ORGANIC SYNTHESIS, YOU NAME IT. SECOND, AND MOST IMPORTANT, THEY WILL GLADLY JOIN THE CAUSE BECAUSE, THIS WILL SOUND CORNY, THEY CARE ABOUT YOU, THE STUDENTS, AND IT WILL BE AN ACHIEVEMENT OF ENORMOUS PROPORTIONS FOR THEM TO SEE YOUNG PEERS WITH INITIATIVE AIM HIGH AND BLOOM.

iGEM RULES COUNSELS A MINIMUM OF TWO ADVISORS ON THE TEAM, WITH AT LEAST ONE BEING A FULL TIME FACULTY MEMBER, BUT MORE CAN BE ADDED THOROUGH. INSTRUCTORS ARE REQUIRED TO COMMIT A FAIRLY LARGE PORTION OF TIME TO THE TEAM IN ORDER TO MAXIMIZE TRAINING EFFECTIVENESS, ALSO, THEY WILL BE IN CHARGE OF REGISTERING THE TEAM AND ITS ROSTER, CERTIFYING THE SAFETY FORM, AND PAYMENT OF TEAM FEES. THEY TOO WILL BENEFIT FROM PARTICIPATING AS IT MAY HELP THEM IDENTIFY POTENTIAL GRAD STUDENTS THAT DEMONSTRATE EXCEPTIONAL AMBITION AND INITIATIVE. iGEM PROJECTS CAN FREQUENTLY BE EXPANDED INTO PROMISING GRADUATE OR POST-DOC PROJECTS AS THEY RAISE MANY INTERESTING SCIENTIFIC AND ENGINEERING QUESTIONS. PARTICULARLY STRONG PROJECTS COULD BRING IN NEW GRANT FUNDING OF BECOME THE BASIS OF COMMERCIAL VENTURE.

#### 1.3.2 ON INSTRUMENTATION AND TECHNOLOGICAL ASPECTS

ANOTHER FUNDAMENTAL PART OF THE iGEM PROCESS IS THE USAGE OF CORRECT INSTRUMENTATION. DEPENDING ON THE TOPIC SELECTED FOR YOUR TEAM TO DEVELOP, YOU MUST BEAR IN MIND WHAT DEVICES AND CHARACTERIZATION TECHNIQUES WILL BE NEEDED. IF THE INSTITUTION YOUR TEAM IS FROM DOESN'T COMPLY WITH THE SUFFICIENT EQUIPMENT LOOK FOR RESEARCH CENTERS AND OTHER INSTITUTIONS NEARBY WHO MIGHT, OR IN EXTREME CASES, PROCURE A REMOTE LAB TO HELP YOU. FORTUNATELY, THIS MIGHT NOT BE THE CASE FOR MANY, BECAUSE IF YOU'RE ENROLLING YOURSELF INTO iGEM IT'S BECAUSE YOU KNOW YOU HAVE MOST OF THE TOOLS NEARBY TO GET ON WITH THE TASK.

THE MINIMUM USEFUL TIME FOR LAB SPACE TO BE AVAILABLE IS ON SUMMER MONTHS FOR NORTH AMERICAN TEAMS. IF POSSIBLE AT ALL, TRY TO FIND READY SPACE TO KEEP YEAR ROUND. DURING FALL, IT WILL BECOME ESSENTIAL, AS TEAMS ARE IN A

HURRY TO GET THE JOB DONE BEFORE THE JAMBOREE.

## 1.4 PUBLICITY AND FUNDING

THERE ARE MANY WAYS TO RAISE FUNDS FOR AN iGEM PROJECT. IT CAN BE IN THE FORM OF CONTACTING COMPANIES OR INSTITUTIONS TO AID IN FEES, ACQUIRING GOVERNMENT GRANTS, OR HAVE THE TEAM WORK IN DISTINCT AREAS TO EARN THE DOUGH. FOR MOST, IT WILL NOT BE EASY, AND PERHAPS, SOME FAMILY FUNDING WILL HAVE TO COME BY. BUT, THERE ARE MANY PEOPLE IN THIS WORLD, AND MAYBE SOMEONE IS WILLING TO HELP YOUNG STUDENTS WITH BRIGHT MINDS.

PUBLICITY IS THE KEY TO MAKE YOURSELF KNOWN. WITHIN YOUR SCHOOL YOU SHOULD BE ABLE TO GAIN PROMOTION OR RECOGNITION, ATTRACTING NEW TEAM MEMBERS, AND EVEN BUZZING THE EARS OF PLAUSIBLE NEW SPONSORS. IT'S THE CONCEPT OF KNOWING HOW TO SELL YOUR IDEA TO PEOPLE, AND LET THEM KNOW THAT YOUR TEAM'S IDEA IS THE IDEA THEY SHOULD ROOT FOR.

## 2. PLANNING AND MORE PLANNING

AS STATED ABOVE, iGEM IS ALL ABOUT PLANNING AND EXECUTING AT THE CORRECT TIME, THINK OF IT AS PURE LOGISTICAL SKILL. THERE ARE LITERALLY TIMES AND DATES FOR EVERYTHING, SO DON'T LET ONE ESCAPE THROUGH OR YOU'LL FIND YOURSELF AND THE TEAM IN A NOT SO COMFORTABLE SITUATION.

### 2.1 PLANNING THE PROJECT

ONCE FAMILIARITY WITH SYN BIO AND THE NATURE OF THE PROJECT HAS BEEN ACQUIRED, WHAT FOLLOWS IS THE DETAILED PLANNING OF THE PROCESS. SUCCESSFUL iGEM PROJECTS HAVE AN INCREDIBLE NUMBER OF ELEMENTS, PARTS AND CIRCUITS TO BE DESIGNED AND MADE, MODELS TO BE WRITTEN AND TESTED, DATA TO COLLECT AND ANALYZE, CERTIFYING LAB SAFETY FORMS, PRESENTATIONS, POSTERS, WIKI, HUMAN PRACTICES, FUNDRAISING, COURSE TAKINGS, TRAVEL, ETC. INSANELY OVERWHELMING FOR ONE PERSON, THAT IS WHERE THE IMPORTANCE OF DELEGATING TASKS AND COORDINATING BEFALLS.

FIRST, BEGIN WITH A BROAD PLAN, ONE THAT CAN BE CONTINUALLY ASSESSED AND MONITORED BY THE PROJECT MANAGER, AND WHO WILL BE ADDING THE MORE SPECIFIC TASKS ALONG THE PATH. THE MORE CHALLENGING PHASE WILL MOST LIKELY BE THE LAB WORK, HERE TEAMS WILL SPEND MOST OF THEIR SUMMER AND FALL, SO A GOOD INPUT FROM INSTRUCTORS AND ADVISORS WILL, IN TURN, REDUCE THE AMOUNT OF WORK REQUIRED.

### 2.2 iGEM REQUIREMENTS

iGEM RULES CHANGE BY THE YEAR, SO IF YOU'RE READING THIS FOR FOLLOWING COMPETITIONS, THERE'S A GOOD CHANCE A LOAD OF CHUNK IS MISSING. ANYWAYS, HERE GO THE AUTHORS' BEST EFFORTS. THE BASIC REQUIREMENTS FOR A MINIMALLY SUCCESSFUL PROJECT INCLUDE THE COMPLETION OF A TEAM WIKI, DISPLAYING A POSTER, SUBMITTING A BIOBRICK PART, GETTING INVOLVED IN HUMAN PRACTICES, AND PRESENTING AT THE JAMBOREE. STILL, HIGHER LEVELS OF ACHIEVEMENT CAN BE REACHED IF THE TEAM MAKES AND CHARACTERIZES A NOVEL WORKING PART AND WITH THAT, CONTRIBUTING TO THE SYN BIO OR A LARGER COMMUNITY.

GOLD, SILVER AND BRONZE MEDAL STATUSES ARE AWARDED TO TEAMS BASED ON THEIR PUBLISHED JUDGING CRITERIA. OTHER PRIZES ARE TOO AWARDED: BEST PRESENTATION, BEST NEW BIOBRICK, BEST MODEL, ETC. THESE TOO, CHANGE GRADUALLY, SO LOOK UP ON THE JUDGING CRITERIA TO BE SURE WHERE YOUR AIMS SHOULD BE AT.

## 2.3 TRACKS

iGEM HAS ITS OWN SET OF CATEGORIES, NAMED TRACKS, EACH OF THESE CONSISTS ON DISTINCT SUBJECTS OF SYNTHETIC BIOLOGY, YOUR TEAM MUST BE ENLISTED IN ONE OF THEM, THE ONE CONSIDERED TO BE THE MOST AKIN TO YOUR PROJECT. AS OF THE LISTED YEAR OF 2014, THERE ARE 8 DIFFERENT iGEM TRACKS ALONG WITH 7 NEW TRACKS.

### 2.3.1 iGEM TRACKS

- 1) **ENERGY.** A MAJOR ECONOMIC DRIVER FOR MOST COUNTRIES IS ENERGY AVAILABILITY AND USE. WHILE NATURAL GAS, OIL AND COAL RESERVES ARE STILL LIKELY TO LAST HUMANITY FOR MANY HUNDREDS OF YEARS, THEIR DISTRIBUTION ACROSS THE PLANET IS NOT EQUAL. THE ABILITY FOR A NATION TO PRODUCE ITS OWN TRANSPORTATION FUEL, IRRESPECTIVE AVAILABLE NATURAL RESOURCES WILL BE A HUGE SOURCE OF ECONOMIC GROWTH IN THE 21ST CENTURY. SYNTHETIC BIOLOGY MAY HAVE THE ANSWER TO SOME, IF NOT ALL OF THESE PRESSING GLOBAL ISSUES
- 2) **ENVIRONMENT.** PROJECTS THAT TACKLE ENVIRONMENTAL ISSUES WITH TEAMS INSPIRED TO WORK ON SOLUTIONS TO PROBLEMS IN THEIR LOCAL AREA.
- 3) **FOOD AND NUTRITION.** EVERYBODY NEEDS TO EAT. BUT WITH OVER 7 BILLION PEOPLE ON THE PLANET, THE PROBLEM OF PRODUCING ENOUGH FOOD AND ENERGY IS COMPLEX AND MULTI-FACETED. WHILE NATIONS HAVE DIFFERENT IDEAS ABOUT CUISINE, EVERYBODY NEEDS ROUGHLY THE SAME NUMBER OF CALORIES PER DAY. THESE CALORIES CAN COME FROM MANY SOURCES, BUT WORLD AGRICULTURAL LAND AND WATER USE IS INCREASINGLY STRETCHED TO COPE WITH OUR CURRENT POPULATION. BETTER SOLUTIONS THAT DON'T RELY ON UNSUSTAINABLE FISHING PRACTICES, INCREASED ARABLE LAND AND INDUSTRIAL AGRICULTURE ARE NEEDED TO COPE WITH OUR EVER-EXPANDING POPULATION.
- 4) **FOUNDATIONAL ADVANCE.** UNLIKE MOST OTHER TRACKS, TEAMS ARE NOT COMPETING TO SOLVE A PRACTICAL PROBLEM. THE FOUNDATIONAL ADVANCE TRACK ALLOWS TEAMS TO COME UP WITH NOVEL SOLUTION TO TECHNICAL PROBLEMS SURROUNDING CORE SYN BIO TECHNOLOGIES.
- 5) **HEALTH AND MEDICINE.** DEPENDING ON WHO YOU ASK, IT COSTS BETWEEN \$800 MILLION TO - 3.5 BILLION US DOLLARS AND ABOUT 14 YEARS TO BRING A DRUG TO MARKET. BEING AS THE HUMAN GENOME WAS ONLY SEQUENCED IN THE YEAR 2000, ONE COULD EXPECT THE FIRST DRUGS TO COME TO MARKET THIS YEAR BASED ON HUMAN GENOME SEQUENCING TECHNOLOGY. WHILE THIS MAY OR MAY NOT HAPPEN IN 2014, THE OPPORTUNITIES FOR MEDICAL TECHNOLOGIES BASED ON GENETICALLY ENGINEERED HUMAN AND BACTERIAL SYSTEMS CANNOT BE UNDERSTATED.
- 6) **INFORMATION PROCESSING.** LIKE THE FOUNDATIONAL ADVANCE TRACK, IP TEAMS ARE NOT TRYING TO SOLVE A REAL WORLD PROBLEM WITH PRACTICAL APPLICATIONS, BUT TO TACKLE AN INTERESTING PROBLEM THAT MIGHT OTHERWISE NOT ATTRACT ATTENTION. TEAMS ENTER THIS TRACK IF THEY ARE ATTEMPTING PROJECTS SUCH AS BUILDING ELEMENTS OF A BIOLOGICAL COMPUTER, CREATING A GAME USING BIOLOGY OR WORKING ON A SIGNAL PROCESSING CHALLENGES.



7) **MANUFACTURING.** MANUFACTURING WILL PLAY A BIG ROLE IN TISSUE ENGINEERING THROUGH THE PRODUCTION OF NEW SKIN, ORGANS AND OTHER MEDICAL SUBSTRATES TO TREAT DISEASE AND INJURY. WHILE THESE PROBLEMS MAY SEEM LIKE MEDICAL TECHNOLOGIES, SCALING THEM UP FROM THE BENCH TO THE CLINIC WILL VERY MUCH REQUIRE INNOVATIONS IN MANUFACTURING.

8) **NEW APPLICATION.** WITHOUT USING THE TERM "CATCH-ALL", THERE IS A CERTAIN DIVERSITY OF PROJECTS THAT IS NOT FOUND AS MUCH IN OTHER TRACKS. NEW APPLICATION TEAMS WORK TO CREATE NOVEL, FORWARD THINKING PROJECTS AND INNOVATIVE IDEAS THAT DON'T FIT INTO CONVENTIONAL PARADIGMS.

### 2.3.2 New Tracks

1) **ART AND DESIGN.** ANOTHER DEVELOPMENT HAS BEEN THE NUMBER OF TEAMS WORKING CLOSELY WITH ARTISTS AND DESIGNERS, INCORPORATING ELEMENTS OF ARTISTIC ENQUIRY AND EXPERIMENTAL SPECULATIVE/CRITICAL DESIGN PRACTICE INTO THEIR PROJECTS, EVEN INSPIRING ENGINEERING/SCIENCE TEAMS TO ADOPT THESE APPROACHES. MUCH OF THIS WORK SEEKS NEW WAYS TO CONSIDER THE ETHICAL, SOCIAL, CULTURAL AND POLITICAL IMPLICATIONS OF SYNTHETIC BIOLOGY, AS WELL AS ADDING STRONG CONCEPTS TO DRIVE iGEM PROJECTS.

2) **COMMUNITY LABS.** THE COMMUNITY LAB TRACK WILL HAVE THE SAME FOCUS ON BENCH RESEARCH AS THE TRADITIONAL iGEM TRACK, HOWEVER WE ARE ALSO LOOKING FOR PROJECTS THAT INCREASE THE ACCESSIBILITY OF SYNTHETIC BIOLOGY.

3) **ENTREPRENEURSHIP.** ENTREPRENEURSHIP IN iGEM IS ABOUT FOSTERING THE DEVELOPMENT OF A NEW INDUSTRY WHERE SYNTHETIC BIOLOGY IS THE UNDERLYING TECHNOLOGICAL PLATFORM. AS WITH ANY NEW INDUSTRY, IT IS NOT CLEAR WHICH BUSINESS PLANS WILL BE THE MOST SUCCESSFUL. BUT, THERE ARE ALSO MORE FUNDAMENTAL QUESTIONS: WHAT BUSINESS MODELS WILL SUCCEED, HOW WILL INTELLECTUAL PROPERTY AFFECT COMPANY FORMATION AND FUNDING, WHAT SKILLS ARE REQUIRED AT EACH STAGE OF COMPANY'S LIFE CYCLE, HOW WILL GOVERNMENT POLICIES PROMOTE OR HINDER NEW COMPANIES, WHAT WILL BE THE SOCIAL CONTRACT WITH SYNTHETIC BIOLOGY COMPANIES?

4) **MEASUREMENT.** THE LIMITS OF OUR KNOWLEDGE ARE SET BY HOW WELL WE CAN CONNECT OBSERVATIONS TO REPRODUCIBLE QUANTITIES THAT GIVE INSIGHT. THE SCIENCE AND TECHNOLOGY OF MEASUREMENT ARE EASILY OVERLOOKED, BECAUSE MEASURING DEVICES ARE SO FAMILIAR TO US, BUT BEHIND EVEN THE SIMPLEST DEVICES LIES AN ELABORATE INFRASTRUCTURE.

5) **MICROFLUIDICS.** MICROFLUIDIC, OR "LAB-ON-A-CHIP" TECHNOLOGY, IS A MATURING FIELD OF RESEARCH INVOLVING MINIATURIZED SYSTEMS WHERE FLUIDS ARE MANIPULATED ON THE SCALE OF NANOLITERS AND PICOLITERS. WITH MICROFLUIDICS IT IS POSSIBLE TO PERFORM HIGH-THROUGHPUT BIOLOGICAL EXPERIMENTS INTEGRATING MULTIPLE FUNCTIONS IN DEVICES NO LARGER THAN A POSTAGE STAMP.

6) **POLICY AND PRACTICES.** THE iGEM POLICY & PRACTICES TRACK AIMS TO STIMULATE INNOVATIVE WAYS OF THINKING ABOUT THE POLICY, ECONOMIC, SOCIAL, LEGAL, AND PHILOSOPHICAL LANDSCAPE OF SYNTHETIC BIOLOGY. TEAMS PARTICIPATING IN THIS TRACK ARE DEVELOPING SKILLS AND TOOLS THAT WILL HELP TO PREPARE SYNTHETIC BIOLOGISTS FOR THE WORLD THEY'RE WORKING IN, AND HELP THE WORLD DECIDE HOW IT MIGHT BEST MAKE USE OF SYNTHETIC BIOLOGY.

7) **SOFTWARE.** WE ENCOURAGE SOFTWARE/COMPUTATIONAL TEAMS TO VALIDATE THEIR TOOLS AND ALGORITHMS WITH SOME EXPERIMENTS. THESE EXPERIMENTS CAN BE "OUTSOURCED", THAT

IS, PERFORMED IN SOME OTHER LAB OR BY A COLLABORATING iGEM TEAM.

YOU'LL BE PRESENTED THE OPPORTUNITY TO PICK THREE OF THE TRACKS MENTIONED ABOVE AND WILL BE CATEGORIZED INTO ONE OF THEM ACCORDING TO AVAILABILITY.

## 2.4 THE TOOLS

MATHEMATICAL MODELS WILL BE NEEDED IN ORDER TO BACK THE PROJECT. GOOD USE OF MATHEMATICA, MATLAB, OR ANY OTHER SIMULATION SOFTWARE IS STRONGLY ADVISED. THE SAME GOES WITH INSTRUMENTATION AND CHARACTERIZATION, AN ARRAY OF DEVICES MUST BE CONSIDERED AND EXPERTISE WILL BE REQUIRED. IN CASE NONE OF THE MEMBERS KNOW HOW TO USE THE MACHINES, TALK TO YOUR INSTRUCTORS OR THE LAB SUPERVISOR, THEY'LL TEACH YOU HOW.

## 2.5 LABELING AND DOCUMENTATION

THE KEEPING AND DOCUMENTING SERVES MULTIPLE PURPOSES: IT WILL BE A HANDY SUPPORT FOR ANY INTELLECTUAL PROPERTY CLAIMS, SERVE AS FACTUAL TABLOIDS WHEN WRITING PAPERS, AS IT WILL BE KEY IN ORDER TO MAKE THE EXPERIMENT REPRODUCIBLE. FOREMOST, THE DOCUMENTATION IS TEAM PROPERTY, AND MUST BE READILY AVAILABLE ANY TIME A MEMBER SOLICITS SO. PROPER DOCUMENTATION WILL ALLOW FOR OTHER TEAM MEMBERS TO KNOW HOW THINGS ARE WORKING OUT AND KEEP UP WITH THE PROJECT'S PROGRESS.

1. THE BASIC GOAL OF GOOD DOCUMENTATION IS TO COMMUNICATE AS EFFICIENTLY AS POSSIBLE. WRITE EVERYTHING THAT NEEDS TO BE WRITTEN; BUT NOTHING MORE.
2. WHILE MOST DOCUMENTATION IS KEPT IN DIARY FORM, HAVING THE ABILITY TO ORGANIZE IT BY PROJECT, SUB-PROJECT OR PERSON IS VERY USEFUL FOR FINDING DATA QUICKLY.
3. DOCUMENT YOUR THINKING ALONG WITH THE EXPERIMENTAL PROTOCOL OR PROCEDURE BEFORE YOU BEGIN THE EXPERIMENT. A HARD COPY LAB BOOK SHOULD ALWAYS ACCOMPANY YOU IN THE LAB, EXCEPT WHEN PERFORMING THE MOST MUNDANE AND REPETITIVE OF TASKS.
4. ALL CONSTRUCTS SHOULD FIRST BE "ASSEMBLED" ELECTRONICALLY IN SILICO. THIS GREATLY REDUCES THE NUMBER OF ERRORS, AS COMPUTERS CAN EASILY CHECK CONFLICTING RESTRICTION SITES AND READING FRAMES FOR FUSION PROTEINS. THE BIOBRICK WEB SITE, AMONG OTHER AVAILABLE TOOLS, PROVIDES CONSTRUCTION CAPABILITIES.
5. AS YOU PERFORM AN EXPERIMENT (OR MAKE A CONSTRUCT) ANY CHANGES TO THE EXPECTED PROTOCOL CAN BE ENTERED, ALONG WITH THE RESULTS.
6. STANDARD OR OBVIOUS STEPS NEED NOT BE ENTERED. HOWEVER, STANDARD PROTOCOLS (FOUND IN THE REFERENCE BINDER, IN SAMBROOK ET AL. OR IN VARIOUS COMMERCIAL KITS) SHOULD BE REFERENCED, AS SHOULD PROTOCOLS ADAPTED FROM PUBLISHED WORK. THESE REFERENCES GREATLY SIMPLIFY THE TASK OF WRITING ARTICLES BASED ON YOUR WORK. THERE ARE FAR FEWER "OBVIOUS" STEPS THAN ONE MIGHT THINK. MOST OF THESE ARE (OR SHOULD BE) IN SOME STANDARD PROTOCOL. ALMOST EVERYTHING ELSE SHOULD BE WRITTEN DOWN.
7. MANY STEPS IN PROTOCOLS INVOLVE THE MIXING OF A NUMBER OF REAGENTS IN A STANDARD REACTION SUCH AS A RESTRICTION DIGEST, PCR, LIGATION, ETC. WHILE IT IS NOT NECESSARY (OR EVEN DESIRABLE) TO WRITE A DETAILED DESCRIPTION OF HOW EACH REAGENT WAS ADDED TO THE TUBE (THIS IS EITHER "OBVIOUS" OR LEFT TO PERSONAL TASTE), IT IS CRITI-





CAL TO ALWAYS LIST ALL THE REAGENTS AND AMOUNTS USED IN THIS PARTICULAR EXPERIMENT. AS REAGENTS ARE ADDED, THEY SHOULD BE CHECKED OFF IN THE LAB BOOK SO AS NOT TO LOSE ONE'S PLACE. THIS PRACTICE ALSO HELPS FOCUS THE EXPERIMENTER ON THEIR WORK. OTHER REACTION CONDITIONS, INCLUDING TIMES AND TEMPERATURES, SHOULD ALSO BE RECORDED. RUNNING CONDITIONS, SUCH AS PERCENT AGAROSE GEL, VOLTAGE AND TIME SHOULD ALSO BE RECORDED.

8. SUPPORTING DOCUMENTATION PRODUCED BY LAB EQUIPMENT SHOULD USUALLY BE INCLUDED IN THE DOCUMENTATION. ELECTRONIC IMAGES OR SCANNED IMAGES MAY BE UPLOADED TO THE WIKI. DOCUMENTS THAT ARE NOT UPLOADED DUE TO SPACE LIMITATIONS, SHOULD BE FILED CAREFULLY AND CROSS-REFERENCED IN THE WIKI. CHROMATOGRAMS MAY BE HELD IN BINDERS, FOR EXAMPLE. ATTACHED DOCUMENTATION SHOULD BE ANNOTATED SO THAT IT IS CLEARLY RELATED TO THE INFORMATION IN THE WIKI. FOR EXAMPLE, GEL LANES SHOULD BE MARKED AND ANY BANDS CUT-OUT SHOULD BE MARKED. ELECTRONIC COPIES SHOULD BE STORED AND THE FILE NAME AND COMPUTER AND FOLDER (OR DIRECTORY) SHOULD BE MARKED IN THE WIKI.

9. LAB NOTEBOOKS OFTEN REFERENCE MATERIAL THAT IS ONLINE ON SOME COMPUTER FILE. IN THIS CASE, THE LAB BOOK AND COMPUTER DOCUMENTATION SHOULD BE CROSS-REFERENCED AND MUST BE IN AGREEMENT. AT THE VERY LEAST, THE SAME NAME MUST BE USED TO DESCRIBE THE SAME CONSTRUCT IN BOTH SOURCES.

10. EVERY EXPERIMENT SHOULD END WITH SOME CONCLUSION. EITHER SOMETHING WAS MADE, VERIFIED, PROVEN, DISPROVEN OR INCONCLUSIVE, NEEDING FURTHER WORK. IN THE LATTER CASE, PROBLEMS AND SUBSEQUENT OR ALTERNATE APPROACHES SHOULD BE DISCUSSED. AT THE VERY LEAST, WHEN NO SOLID CONCLUSION IS POSSIBLE, A LINK TO THE NEXT PAGE THAT CONTINUES THE EXPERIMENT SHOULD BE INCLUDED.

11. MOST EXPERIMENTS (AND ALL PROJECTS) TAKE PLACE OVER A NUMBER OF DAYS AND MAY BE INTERRUPTED BY OTHER WORK. THE INCLUSION OF "CONTINUED TO" AND "CONTINUED FROM" FIELDS ON EACH WIKI PAGE SHOULD ASSIST IN PROVIDING CONTINUITY, AS SHOULD A TABLE OF CONTENTS.

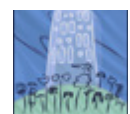
12. COMPLETE DOCUMENTATION STANDARDS SHOULD BE DEVELOPED ON A CONTINUOUS BASIS BY THE TEAM.

GOOD LABELING AND STORAGE OF PLASMIDS, GLYCEROL STOCK, PLATES, INTERMEDIATE CONSTRUCTS, ETC. IS ABSOLUTELY CRUCIAL IN ENABLING TEAM MEMBERS TO FIND AND IDENTIFY THE REAGENTS THEY NEED. IN ADDITION TO BEING CORRECT AND COMPLETE IN THEIR DESCRIPTIONS, WE ALSO NEED TO ENSURE THAT USING THE LABELING AND FILING SYSTEMS DOES NOT BECOME THE MAJOR WORK ACTIVITY; SYSTEMS MUST BE EFFECTIVE BUT EFFICIENT. THE FOLLOWING SYSTEM HAS BEEN DEVELOPED THROUGH MANY YEARS OF EXPERIENCE (BOTH IN THE LAB AND IN SYSTEMS DESIGN) AND CONSIDERABLE ATTENTION HAS BEEN PAID TO MAKING IT MATCH THESE CRITERIA. HOWEVER, THESE STANDARDS ARE INTENDED TO BE DYNAMIC AND SUBJECT TO THE CONSENSUS OF THE PROJECT TEAM. CONSIDER THEM SUGGESTIONS FOR THE START OF AN EFFECTIVE COMMUNICATIONS PROTOCOL.

### 2.5.1 EP TUBES (MICROFUGE TUBES, 1.5 ML TUBES, ETC.)

1. GIVE EVERY TUBE A LABEL, EVEN TEMPORARY ONES.

2. LABELS FOR PERMANENT CONSTRUCTS SHOULD HAVE A NAME OR NUMBER THAT IS DESCRIBED BY AN ENTRY IN A LAB BOOK OR WIKI. NAMING CONVENTIONS AND ALLOWABLE PART NUMBERS FOR A TEAM ARE DESIGNATED BY iGEM HQ EACH YEAR. FOLLOWING SEQUENCE VERIFICATION, A COLORED LABEL SHOULD BE AFFIXED TO THE TOP OF A PERMANENT CONSTRUCT AND IT SHOULD BE STORED IN THE APPROPRIATE -20°C BOX.



3. PERMANENT DNA (I.E. ANY FINISHED AND VERIFIED CONSTRUCT) SHOULD HAVE THE DATE AND A PAGE REFERENCE NUMBER (PAGE WHERE FINAL SEQUENCE WAS VERIFIED) ON THE SIDE OF THE TUBE. FOR EXAMPLE, THIS MIGHT LOOK LIKE 00050-128; WHERE THE FIRST 5 DIGITS ARE THE BOOK NUMBER AND THE LAST THREE ARE THE PAGE NUMBER.

4. IT IS NEVER NECESSARY TO WRITE "MINIPREP" ON A TUBE AS THIS IS THE DEFAULT. OTHER "IN PROGRESS" MARKINGS MAY BE USED AS FOLLOWS (FOR 1.5 ML TUBES):

1. "/" MEANS "TREATED WITH ENZYMES...". FOR EXAMPLE WM0302/EcoRI+PstI MEANS WM0302 DIGESTED WITH ENZYMES EcoRI AND PstI AT THE SAME TIME (I.E. A DOUBLE DIGEST). /EcoRI/PstI MEANS DIGESTED WITH EcoRI THEN WITH PstI. THIS ALLOWS YOU TO DESCRIBE A STRING OF TREATMENTS, INCLUDING DEPHOSPHORYLATION, PHOSPHORYLATION, BLUNT ENDING, ETC.

2. PCR PRODUCTS SHOULD SAY "PCR" ON THE TAB OF THE TUBE. IT IS NOT NECESSARY TO PUT PRIMER NAMES ON THE TUBE, THOUGH THE TUBE SHOULD BE CROSS-REFERENCED TO THE LAB BOOK.

3. GEL CUTOUTS (FRAGMENT IN GEL) SHOULD HAVE THE FRAGMENT SIZE ALONG WITH RESTRICTION ENZYMES USED OR "PCR" ON THE TUBE.

4. GEL-PURIFIED FRAGMENTS SHOULD HAVE A "P" ON THE TAB. DIGESTS OR PCR USED TO PRODUCE THE FRAGMENT SHOULD BE NOTED.

5. LIGATION MIXES SHOULD HAVE AN "L" ON THE TAB OF THE TUBE. LIGATIONS MAY SPECIFY THE TWO COMPONENTS BEING LIGATED, BUT IT IS BETTER TO GIVE THEM A NEW CONSTRUCT NAME.

5. A SERIES OF "IN PROGRESS" TUBES (E.G. SEVERAL PLASMIDS ALL SUBJECTED TO THE SAME DIGEST) MAY BE NUMBERED "1, 2, 3,..." OR "A,B,C,..." OR ANY OTHER MEANINGFUL SYSTEM. THE FIRST TUBE IN A SERIES SHOULD CONTAIN ALL THE INFORMATION EXPECTED FOR A PERMANENT DNA TUBE. IT SHOULD HAVE A CLEAR, DESCRIPTIVE LABEL ON THE TOP AND A DATE AND LAB BOOK PAGE REFERENCE ON THE SIDE.

6. "IN PROGRESS" TUBES MAY BE STORED IN PLASTIC RACKS OR IN MORE PERMANENT FREEZER BOXES IN THE -20°C FREEZER. IN GENERAL, RACKS SHOULD ONLY STORE TUBES WHILE THE TUBE CONTENTS ARE UNDER ACTIVE (I.E. AT LEAST TWICE A WEEK) USE. TUBES LEFT UNTOUCHED IN RACKS FOR OVER A WEEK SHOULD BE RETURNED TO THEIR PROPER FREEZER BOXES.

7. FREEZER BOXES (BOTH -20 °C AND -80 °C SHOULD BE LABELED BY PROJECT NOT BY PERSON). THE TEAM SHOULD COOPERATE TO DEVELOP PROJECT LABELS FOR BOXES.

### 2.5.2 GLYCEROL STOCK

1. FOR EVERY NEW CONSTRUCT, AND FOR EVERY CONSTRUCT IN A NEW BACTERIAL STRAIN, A GLYCEROL STOCK MUST BE MADE SHORTLY AFTER VERIFICATION OF THE CONSTRUCT AND STORED AT -80°C.

2. THE NAME OF THE CONSTRUCT SHOULD BE WRITTEN ON THE TOP OF THE TUBE AND THE SIDE OF THE TUBE SHOULD HAVE THE CONSTRUCT NAME, HOST BACTERIAL STRAIN NAME, DATE, AND LAB BOOK REFERENCE.

3. A LABEL MAKER MAY BE USED FOR THIS, IF THERE IS NOT ADEQUATE SPACE FOR HANDWRITING.

4. FOR STRAINS WITH NO CONSTRUCT, THE STRAIN NAME, DATE FROZEN, AND LAB BOOK REFERENCE IS SUFFICIENT. THE LAB BOOK ENTRY FOR A RECEIVED STRAIN SHOULD DOCUMENT WHERE THE STRAIN CAME FROM, ITS GENOTYPE AND PHENOTYPE, AND A RELEVANT PUBLISHED REFERENCE.

PCR TUBES AND STRIPS PCR REACTIONS, DIGESTS AND LIGATIONS (AMONG OTHER REACTIONS) CAN ALL TAKE PLACE IN 200 ML PCR TUBES OR STRIPS. THESE HAVE LITTLE OR NO SPACE FOR



WRITING SO SPECIAL CONDITIONS APPLY.

1. GENERALLY ONE OR TWO DIGITS OR LETTERS CAN BE WRITTEN ON THE SIDE OF THE TUBE. THIS SHOULD BE ADEQUATE TO IDENTIFY THE TUBE ON THE DAY IT IS USED, BY CONSULTING THE RESPONSIBLE PERSON OR THEIR LAB BOOK.

2. WHEN PCR TUBES OR STRIPS NEED TO BE STORED FOR LONGER, THEY SHOULD BE PLACED IN THE APPROPRIATE RACK AND A LABELED PIECE OF TAPE PLACED OVER OR BESIDE THEM. THE LABEL ON THE TAPE SHOULD FOLLOW THE SAME RULES AS FOR 1.5 ML EP TUBES, INCLUDING A DESCRIPTIVE NAME, DATE, AND LAB BOOK REFERENCE.

### 2.5.3 CULTURE TUBES

1. CULTURE TUBES ARE GENERALLY TEMPORARY AND CAN BE LABELED ON THE SIDE OF THE TUBE (ON THE GLASS) OR ON THE SIDE OF THE LID. THE SIDE OF THE TUBE IS PREFERRED BECAUSE THE LID CAN BE MOVED TO A DIFFERENT TUBE. ALSO SHARPIE WRITING ON GLASS IS EASIER TO REMOVE THAN ON PLASTIC.

2. BACTERIAL STRAINS SHOULD BE LABELED AS FOR GLYCEROL STOCKS.

3. TUBES ARE FREQUENTLY USED IN A SERIES. IN THIS CASE SIMILAR RULES AS FOR SERIES OF EP TUBES, CAN APPLY.

4. CULTURE TUBES OFTEN ADD ANTIBIOTICS OR OTHER CHEMICALS INTO THE MEDIA. THE FIRST TUBE SHOULD RECORD ALL THE PERTINENT INFORMATION WHEN ALL THE REST OF THE TUBES ARE SIMILAR. TUBES WITH DIFFERENT ANTIBIOTIC OR CHEMICAL TREATMENTS SHOULD RECORD THESE ON EACH INDIVIDUAL TUBE.

### 2.5.4 PLATES

1. PLATES WITH BACTERIA MAY BE USED FOR VERY SHORT OR MEDIUM TERM. IN ADDITION TO IDENTIFYING PLASMIDS AND BACTERIAL STRAINS ON THE PLATE, GROWTH AND EXPERIMENTAL CONDITIONS ALSO NEED TO BE IDENTIFIED.

2. GENERALLY, LABELING SHOULD BE CONSISTENT WITHIN THE TEAM. PLATES ARE ALWAYS LABELED ON THE BOTTOM, NEVER ON THE LID.

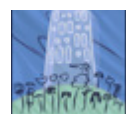
3. POURED PLATES SHOULD ALWAYS BE STORED WITH THE MEDIA NAME AND SELECTION CHEMICALS WRITTEN ON THEM. FOR EXAMPLE "LB + AMP50". NOTE THAT THE CONCENTRATION OF THE ANTIBIOTIC SHOULD BE WRITTEN ON EACH PLATE.

4. ANY ADDITION SELECTION OR DETECTION REAGENTS AND GROWTH CONDITIONS SHOULD BE ADDED IN THE SAME REGION OF THE PLATE AS THE MEDIA DESCRIPTION. FOR EXAMPLE "LB + AMP50 + IPTG (4UL) + X-GAL (40UL) - 37°C" MIGHT BE A FULL DESCRIPTION OF THE MEDIA AND GROWTH.

5. WITH THE MEDIA AND GROWTH CONDITIONS ON THE LEFT SIDE OF AN INVERTED PLATE (LID UPSIDE DOWN), THE DATE SHOULD BE RECORDED ALONG THE BOTTOM OF THE PLATE. THE STRAIN NAME AND ANY RELEVANT GENOTYPIC INFORMATION ARE RECORDED AT THE TOP AND EXPERIMENTAL CONDITIONS ARE RECORDED ON THE RIGHT SIDE OF THE PLATE. THE STRAIN NAME SHOULD FOLLOW THE CRITERIA FOR GLYCEROL STOCKS NAMES. EXPERIMENTAL CONDITIONS INCLUDE AMOUNT OF BACTERIA PLATED, ANY SPECIAL CONDITIONS, ETC. FOR EXAMPLE, FOR A STANDARD LIGATION 150 UL'S ARE USUALLY PLATED OUT OF THE 1000 UL'S IN THE RECOVERY TUBE; THIS CAN BE RECORDED AS 150/1000.

6. FOR PLATING LIGATIONS, THE NAME OF THE INTENDED RESULTING CONSTRUCT SHOULD BE USED BUT THE NEGATIVE CONTROL (NO INSERT) SHOULD USE THE NAME OF THE ORIGINAL VECTOR ALONG WITH RESTRICTION DIGEST AND OTHER PREPARATORY ENZYMATIC REACTIONS, SUCH AS DEPHOSPHORYLATION.

## 2.6 TEAM MEETINGS



TEAM MEETINGS SHOULD BE HELD AT A REGULAR BASIS, WEEKLY, AS THE MOST RECOMMENDED FREQUENCY. DURING MEETINGS, MEMBERS CAN ABSORB MORE OF THE ACTUAL PROCEEDINGS, AND SHARE THEIR ADVANCE OF THE PROJECT. IT IS AS WELL THE BEST WAY TO OUTLINE THE PROJECTED WORK SCHEME FOR THE WEEK AND DELEGATE TASKS ACCORDINGLY. MEETINGS ARE EXPECTED TO LAST FROM ONE TO TWO HOURS, IN SPECIFIC CASES, IT MIGHT REQUIRE INSTRUCTIONAL TIME AND LAST LONGER. INSTRUCTORS AND ADVISORS ARE EXPECTED TOO, TO ATTEND THE BUSINESS PORTION OF THE MEETING AND OPT WHETHER TO HANG DURING THE INSTRUCTIONAL PHASES.

NOTHING IS MORE DISCOURAGING THAN TEAM MEMBERS WHO CAN'T BOTHER THEMSELVES TO SHOW UP FOR THE MEETINGS. THAT IS WHY IT IS REASONABLE TO SEEK WEEKNIGHT HOURS, WHERE MOST CLASSES OR OTHER EVENTS ARE LESS PROBABLE, FOR THE WEEKLY MEETINGS. AS THE JAMBOREE DATE COMES CLOSER, WEEKEND MEETINGS WILL TOO BECOME AN OPTION IN ORDER TO PREPARE BETTER. COMMITMENT IS CRUCIAL TO HOLD THE TEAM TOGETHER AND MOTIVATED. PROCURE TO KEEP A SERIOUS YET LIGHT ENVIRONMENT, AND TRY NOT TO GO ASTRAY ON SUBJECTS OF LESSER IMPORTANCE.

THE FIRST SESSIONS WILL MOST ASSUREDLY FOCUS ON INSTRUCTIONAL ISSUES. IN AN ATTEMPT TO COVER THE MAIN TOPICS REGARDING THE COMPETITION, THE FOLLOWING LIST HAS BEEN ASSEMBLED:

- INTRODUCTION TO SYNTHETIC BIOLOGY
- INTRODUCTION TO iGEM
- REVIEW OF PAST iGEM COMPETITIONS
- LITERATURE SEARCHES AND READING PRIMARY LITERATURE. PUBMED, GOOGLE SCHOLAR, PATENT LITERATURE
- MAINTAINING A LITERATURE DATABASE
- EEELS ISSUES AND STUDIES
- GENETIC CIRCUITS
- PROTEIN ENGINEERING
- METABOLIC ENGINEERING
- MOLECULAR BIOLOGY BASICS (DIGESTS, GELS, LIGATION, TRANSFORMATION, SEQUENCING)
- MATHEMATICAL MODELING
- BIOINFORMATICS AND SUPPORT TOOLS (ENTREZ, BLAST, VECTOR NTI, PRIMER DESIGN)
- BIOBRICKS AND THE BIOBRICK FOUNDATION
- BIOCHEMICAL ASSAYS AND ANALYSIS
- INSTRUMENTATION (FACS, MICROARRAYS, MICROSCOPY, ETC.)
- BIOLOGICAL READOUTS
- ADVANCED MOLECULAR BIOLOGY (PCR, NORTHERNS, WESTERNS, MICROARRAYS, ETC.)
- FUNDRAISING
- HTML AND WIKIS
- POWERPOINT AND PHOTOSHOP
- BASICS OF PRESENTATIONS AND POSTERS
- KEEPING A LAB NOTEBOOK
- DOCUMENTATION OF PARTS
- NAVIGATING THE REGISTRY OF BIOLOGICAL PARTS
- TEAM WORK AND LEADERSHIP STRATEGIES. HOW TO RUN A MEETING.
- LAB SAFETY

## 2.7 POSTER AND PRESENTATION

A THOROUGH UNDERSTANDING OF THE SCIENCE BEHIND THE PROJECT IS ONLY THE STEPPING STONE. IT IS HIGHLY RECOMMENDED TO REVIEW PRESENTATIONS FROM PREVIOUS EDITIONS TEAMS AND WORK ON YOUR PRESENTING SKILLS. STANDARDS ARE QUITE HIGH, SO GOOD ATTENTION INTO DETAIL IS ADEQUATE MEASURE. GREAT PRESENTERS GO BEYOND THE CLASSICAL



SCIENTIFIC CONFERENCE TYPE OF TALK, THEY MAKE IT FUN AND ACTUALLY ENJOY THEMSELVES PERFORMING IN IT.

PRESENTATION TEAMS ARE USUALLY SMALL, FARILY 3-5 MEMBERS WHEN ALL MEMBERS SPEAK ENGLISH. PRESENTING THE RESEARCH IS AN IMPORTANT PART, HOWEVER, IT IS CONSIDERABLE WORK. THE PRESENTERS MUST BE ABLE TO COMMUNICATE THEIR IDEAS CLEARLY AND BE SPEAKERS OF AUTHORITY. INDIVIDUAL PRESENTERS REQUIRE AT LEAST 12 HOURS OF TEAM PRACTICE AND MUCH MORE INDIVIDUAL PRACTICE. PRESENTATION IS ONLY 20 MINUTES LONG, CONSIDER NO MORE, NO LESS. IN GENERAL, THE PRESENTATION SHOULD INCLUDE THE FOLLOWING:

- PRESENT THE TEAM, INSTITUTION (MAYBE CITY AND COUNTRY)
- OUTLINE THE REASON THE PROJECT IS IMPORTANT
- DISCUSS THE BASIC BACKGROUND SCIENCE
- DESCRIBE THE APPROACH TO SOLVING THE PROBLEM
- PRESENT THE MODEL AND ITS PREDICTIONS
- DESCRIBE BIOBRICK PARTS MADE, SEQUENCED, SUBMITTED AND CHARACTERIZED
- DESCRIBE ASSAYS AND RESULTS
- DRAW CONCLUSIONS OF WHAT WORKED AND WHAT DIDN'T
- TALK ABOUT FUTURE PLANS
- THANKS ADVISORS AND INSTRUCTORS
- THANK FINANCIAL SUPPORTERS
- ALL IN ABOUT 20 – 30 SLIDES (AT ONE MINUTE OR LESS PER SLIDE)

POSTERS ARE ALSO AN IMPORTANT PART OF THE COMPETITION AND PREVIOUS POSTERS SHOULD BE EXAMINED FOR IDEAS ON PRODUCING SUCCESSFUL POSTERS.

### 3. GETTIN'ER HANDS DIRTY

PLANNING IS TALKING, WHAT MATTERS IS GETTING THE JOB DONE, RIGHT? THAT'S WHERE THE LAB PORTION OF THE PROJECT KICKS IN. AS STATED BEFORE GOOD DOCUMENTATION WILL BE A MAJOR PLAYER IN THIS PHASE, TEAM MEMBERS WILL WORK AT DIFFERENT TIMES AND ON ALTERNATE TASKS SIMULTANEOUSLY. COMMUNICATION IS ESSENTIAL. THE APPOINTING OF A PROJECT MANAGER WHO, NOT NECESSARILY IS DIRECTLY INVOLVED INTO EACH STEP, BUT OTHERWISE OVERSEES PROGRESS AND RECORDS SCHEDULE OF THE MANY TASKS TO BE DONE WILL GO A LONG WAY TOWARDS MAINTAINING EVERYONE'S SANITY. PAUSES WILL BE NEEDED, MONTHLY, IN ORDER TO ASSESS THE CURRENT STRUCTURE OF TASK DILIGENCE AND THE OVERALL STATUS OF THE MEMBERS, THIS WILL AID TO RECON SPOTS WHERE ASSISTANCE IS MORE REQUIRED AND TASKS THAT ARE CLOSE TO END AND LOWER IN PRIORITY. IT IS ALSO A GOOD WAY TO CHECK ON TEAM'S EXPECTATIONS FOR EACH MEMBER, GIVE FEEDBACK AND SEE IF THEY'RE BEING MET. RED FLAGS ARE SHOWN IF THE QUESTION IS MET WITH SILENCE, A SERIOUS REVIEW OF GOALS SHOULD BE MADE. SILENCE ALSO INDICATES THAT TRUST BETWEEN MEMBERS IS NOT IN HIGH NUMBERS.

#### 3.1 THE LAB

TAKING INTO ACCOUNT THAT PREVIOUS ASSESSMENT OF LABORATORY INSTRUMENTALS HAS BEEN DONE, THE MOST ENVELOPING, YET MOST SATISFYING PART COMES UP: LAB WORK. A MAJOR GOAL OF THE iGEM COMPETITION IS TO PRODUCE FUNCTIONAL, WELL-CHARACTERIZED BIOBRICK PARTS. BY THIS TIME, MOST TEAM MEMBERS INVOLVED IN WET LAB SHOULD HAVE

BEEN INVOLVED IN A COURSE REGARDING THE BASICS OF MOLECULAR BIOLOGY. THIS TO FACILITATE COMPREHENSION OF THE PROCEDURES THAT ARE ABOUT TO TAKE PLACE.

MEMBERS WILL COME FROM MANY DISTINCT BACKGROUNDS AND LEVELS, EXPERIENCE AND KNOWLEDGE OF MOLECULAR BIOLOGY WILL VARY GREATLY. THEREFORE IT IS RECOMMENDED TO PAIR THE MORE EXPERIENCED MEMBERS WITH THE LESSER, IN ORDER TO PROMOTE GROWTH AND TO ENSURE MOST MEMBERS WILL BE WORKING AT A SIMILAR PACE BY THE DEFINING WEEKS. MOLECULAR BIOLOGY IS NO CAKEWALK, SURE, MANY PROCEEDINGS HAVE IN TURN EVOLVED AND BECOME MORE EFFICIENT, YET, TREATING WITH CULTURES AND ORGANISMS ALSO REQUIRES PATIENCE AND GOOD ORGANIZING. VOLUNTEERS WILL BE ACCEPTED AND PUT TO WORK, FULL-TIME MEMBERS WILL TOO, FIND THEIR HANDS FULL FROM TIME TO TIME, EVEN THE INSTRUCTORS WILL HAVE THEIR SHARE OF STUDENTS FLOCKING INTO THEIR DESKS FOR TUTORING OR WORDS OF ENCOURAGEMENT. IT IS THE ESSENCE AND BEAUTY OF LAB WORK.

#### 3.2 CHALLENGES WILL BE MET, KEEP STRENGTH OF BODY AND MIND

LAB WORK WILL EVENTUALLY, SAMPLE AFTER SAMPLE, BECOME A TEDIOUS ROUTINE. BUT, DO NOT DESPAIR, EITHER BECAUSE RESULTS WON'T COME OUT AS EXPECTED OR IT'S JUST SCIENCE'S WAY TO PLAY AROUND WITH YOU IN ORDER TO SHOW RELIABILITY, FOR iGEM PROJECTS ARE OF SHORT, STILL INTENSE, DURATION THAT YOU WILL EVENTUALLY MISS THE STRANGE MIXTURE OF FEELINGS THE COMPETITION EVOKED IN YOU. EXPECTATION, FRUSTRATION, MOTIVATION, DESPAIR, DISCOURAGEMENT, A REKINDLED LOVE FOR THE PROJECT, LOSS OF FAITH, TRUST ISSUES, EXCITEMENT AND CONTINUOUS HOPE TO SEE THE PROJECT THROUGH ARE JUST PART OF THE SOUP MIXTURE OF FEELINGS YOU'LL BE EXPERIENCING (MY MONEY ON IT). THINGS WILL NOT WORK AT THE FIRST TIME, THAT IS MOST A CERTAINLY FACT, MISTAKES WILL OCCUR AND FREQUENTLY. THE RECOGNITION OF MISTAKES SHOULD BE ENCOURAGED AND CONGRATULATED, RATHER THAN HIDING THEM, THIS WILL ENABLE THE TEAM GET ON TRACK MORE QUICKLY AND THE TRUST AMONG PARTNERS WON'T BE COMPROMISED.

### 4. SOCIAL INTERACTION

THE FACT THAT iGEM IS ABOUT INVOLVING IN WET LAB WORK A GOOD AMOUNT OF TIME DOESN'T MEAN THAT ISOLATION IS THE TACTIC TO FOLLOW THROUGH. iGEM ENCOURAGES, AND SO DO THE AUTHORS, COMMUNICATION AMONG TEAMS, SO THAT THEY CAN SHARE IDEAS AND EXPERTISE BETWEEN THEM, TALK AND HANG OUT AND EVEN COLLABORATING INTO DEVELOPING NEW, AMAZING, BIOBRICKS.

THE SOCIAL NETWORKS CAME TO STAY, AND SO iGEM DOES WANT NOT MISS THIS OPPORTUNITY AND FOSTERS TEAMS TO HAVE THEIR OWN FACEBOOK AND TWITTER ACCOUNTS, SO THAT THEY CAN SHARE THE LATEST NEWS AND COMMUNICATE WITH THE OTHER iGEM TEAMS THAT ARE PARTICIPATING IN THE JUST. FROM TIME TO TIME, iGEM HEADQUARTERS' WILL TO CONTACT iGEM TEAMS THROUGH THIS MEDIUM.

AND OBVIOUSLY, INTERACTION AMONG THE MEMBERS IS MOST CRUCIAL. WEEKEND HANG OUTS, OR BEERS WITH PIZZA HALF IN THE WEEK (THIS IS HOW I WAS ENAMORED INTO iGEM), IT ALL WORKS OUT TO ACHIEVE AN EFFECTIVE, DYNAMIC TEAM.

### 5. JOB'S ALMOST DONE!



AFTER THE SUMMER, WHEN STUDENTS COME BACK TO THE FALL SEMESTER, IT IS INDISPENSABLE TO HOLD ANEW MEETINGS TO REVIEW WHERE WAS WORK LAST HELD, AND HOW MUCH IS IT REQUIRED IN ORDER TO ACHIEVE COMPLETION. IT IS EASY TO THINK THAT THE PROJECT IS NEARLY DONE, BUT FINAL ADJUSTMENTS ARE STILL TO BE MADE. THERE WILL MOST CERTAINLY BE LAB WORK STILL TO BE COMPLETED, DOCUMENTATION TO FINISH AND THE BIG JAMBOREE TO PREPARE FOR.

## 5.1 DOCUMENT IT TO WIN IT

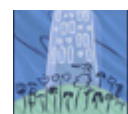
IGEM PROJECTS MUST BE FULLY DOCUMENTED ON THE WIKI AND THE BIOBRICKS PARTS SUBMITTED. RESEARCH ON PREVIOUS PARTICIPATING TEAM WIKIS IS ADVISED, THERE ARE PAGES THAT REFLECT AMAZING TALENT AND CREATIVITY, USE THEM AT YOUR FAVOR, FOR THE SUBMITTED WIKI DOES HAVE A FEW LIMITATIONS, LIKE WORKING ONLY ON HTML SCRIPTS, FOR INSTANCE. WINNING WIKIS CONTAIN WELL-FORMATTED PAGES WITH MANY INTERESTING IMAGES. THE MAIN PAGE SHOULD BRIEFLY DESCRIBE THE PROJECT, THE INSTITUTION, HOME CITY, SPONSORS, ETC. AND THE OTHER PAGES ARE FOR DETAILED INFORMATION SUCH AS THE CONCEPT, TEAM MEMBERS, AND THE MANY PHOTOS. THE TEAM MANAGER ALSO MIGHT DOCUMENT ON TEAM ACTIVITIES, SUCH AS THE HUMAN PRACTICES HELD, IDEAS AND RELEVANT REFERENCES. A MODELING PAGE CAN INCLUDE FORMULAS AND MODELING RESULTS ALONG WITH THE SOURCE CODE FOR SIMULATION. A PARTS PAGE CAN INCLUDE AN OVERVIEW OF BIOBRICK PARTS FOR THE PROJECT, THE DESIGN, CONSTRUCTION AND CHARACTERIZATION. FULL PARTS SHOULD BE DOCUMENTED IN BIOBRICKS. COLORFUL, WELL-DESIGNED IMAGES WHICH CLEARLY CONVEY THE INFORMATION ARE THE GOAL FOR THESE PAGES. PROGRESS DURING WET LAB IS TO BE DOCUMENTED IN THE NOTEBOOK PAGES, WHICH ARE TO CONTAIN DETAILED INFORMATION AND ACT LIKE AN ELECTRONIC LAB JOURNAL. THE STANDARD WIKI COMES WITH CALENDAR LIKE NOTEBOOK ENTRIES, BUT IT IS ENHANCED WITH BETTER BROWSING CAPABILITIES. ABOVE ALL, THE WIKI MUST BE CLEAR, COMPREHENSIVE, ENTERTAINING, ATTRACTIVELY-FORMATTED AND EASY TO NAVIGATE, AND COMPLETE.

## 6. THE JAMBOREE

REMEMBER BEFORE LEAVING, TO COMMUNICATE YOUR VARIOUS NEWS AGENCIES THAT THE TEAM HAS BEEN WORKING HARD AND IS READY TO COMPETE. NOT ONLY WILL YOU RAISE LOCAL INTEREST AND TEAM SPIRITS, JUDGES ARE IMPRESSED BY TEAM EFFORTS TO PROMOTE SYN BIO AND IGEM. SEVERAL WEEKS BEFORE THE JAMBOREE, MOST TEAMS HAVE HAD UPDATED THEIR WIKIS AND ABSTRACTS, IT SERVES AS GOOD PIECE OF ADVICE TO RESEARCH ON OTHER TEAMS THEMES. AS IN ANY OTHER CONFERENCE, THE IGEM JAMBOREE IS A SPACE OF KNOWLEDGE EXCHANGE, AND IT THERE WILL BE PLENTY TO TALK ONCE ARRIVING INTO THE CONVENTIONS CENTER.

### 6.1 PRACTICE

UPON ARRIVING AT THE JAMBOREE, PRACTICE TIMES ARE SETUP THE FORTNIGHT PRECEDING THE NEXT DAY'S COMPETITION. PRACTICE WILL BE HELD AT A SPACE SIMILAR TO THE ONE TEAMS WILL BE OFFICIALLY PRESENTED, PRACTICES TOO, WILL BE SCHEDULED, SO IN THE CIRCUMSTANCE THAT TEAMS ARE RUNNING LATE, TRY TO BE POLITE AND COMPREHENSIVE. TRY TO KEEP A



SERIOUS YET RELAXED TONE, MINIMIZE ANXIETY AND FEEL FREE TO APPRECIATE OTHER TEAMS' REHEARSALS.

### 6.2 ATTENDING TALKS, VIEWING POSTERS

MEMBERS SHOULD ATTEND A WIDE VARIETY OF OTHER TALKS, BOTH WITHIN AND OUTSIDE THEIR STREAM. FOR CERTAIN, "BIG-SCHOOLS" TALKS WILL BE OF INTEREST, BUT TAKE ON THE SMALLER LESS KNOWN SCHOOLS EFFORTS, TOO. YOU NEVER KNOW WHAT YOU MIGHT FIND IN THEM. QUESTIONING IS ALWAYS PART OF THE SCIENTIFIC COMMUNITY, STILL, TRY TO FRAME YOUR QUESTIONS ON CURIOSITY RATHER THAN FROM A CHALLENGING PERSPECTIVE. REMEMBER, DON'T DO TO OTHERS WHAT YOU DON'T WANT TO BE DONE UPON YOU. MAKE THE TEAM GO ABOUT A LARGE QUANTITY OF POSTERS, EVERYONE LOVES TO TALK ABOUT WHAT THEY'VE BEEN DEVOTING MOST OF THEIR NATURAL YEAR INTO. THIS WILL TOO, ENHANCE THE LEARNING EXPERIENCE.

### 6.3 PRESENTATION TIME

ARRIVE ON TIME AT THE PRESENTATION ROOM AND BE PREPARED TO SETUP FOR IT QUICKLY. EACH TEAM NEEDS TO BRING IN THEIR OWN COMPUTER AND REMOTE PRESENTATION DEVICE OR LASER POINTER, THE JAMBOREE PROVIDES THE PROJECTOR AND SOUND, ALONG WITH TECHNICAL SUPPORT. BE PREPARED FOR ANYTHING. THE SELECTION OF THE WINNERS IS ALWAYS A MYSTERY, SO THAT IS NOT A THING YOU SHOULD WORRY ABOUT. BUT, YOU'VE REHEARSED FOR IT. ENJOY, THIS IS YOUR MOMENT, WHAT YOU'VE SO MUCH BEEN WORKING FOR. MAKE IT HAPPEN.

### 6.4 DEBRIEFING

FEEDBACK SHOULD BE GIVEN AMONG THE PARTICIPANTS, WHAT WAS DONE CORRECTLY, AND WHAT NEEDS TO BE WORKED ON. FOR THOSE THAT WILL BE RETURNING THE FOLLOWING YEAR, IT WILL SERVE THEM AS GUIDE TO LEAD THEIR TEAMS INTO HIGHER PEAKS. ONCE THE WINNERS ARE DETERMINED, GO AND REVIEW THE DISTINCT PROJECTS THAT EARNED IT. COLLECT OBJECTIVE STATISTICS AND EVALUATE IDEAS. ARDUOUS AND TIME CONSUMING AS IT MAY BE, IT WILL BE HELPFUL FOR NEXT YEAR'S COMPETITION.

### 6.5 WHAT'S NEXT?

THE JAMBOREE IS UP, AND YOU'RE PICKING YOUR LUGGAGE FROM THE AIRPORT RAIL. YOU MIGHT THINK YOU'VE DONE YOUR PART, BUT SUCCESSFUL IGEM TEAMS GET TO WORK ALMOST AS SOON AS THEY LAND. WRITE A FINAL REPORT ON YOUR ACHIEVEMENTS FOR THE SPONSORS, THANKING THEM AND DISCUSSING NEXT YEAR'S PLANS. IMMEDIATELY CONTACT AGAIN THE NEWS AGENCIES, AND BEGIN TO GENERATE EXPECTANCY OVER THE NEXT YEAR'S TEAM. PLAN A GATHERING TO CELEBRATE AND BEGIN RECRUITING ANEW. ONCE AGAIN, WELCOME TO IGEM!

## 7. QUESTIONNAIRE

ONCE A GROUP OF STUDENTS HAVE DECIDED TO ENTER THE CONTEST, GIVEN THAT THEY ARE ALL CONVINCED AND HAVE THE REQUIRED WILL POWER, WE COULD AGREE TO SAY THAT THE BIGGEST STEP HAS ALREADY BEEN TAKEN. NEVERTHELESS, THEY WILL ENCOUNTER DIFFERENT SITUATIONS IN WHICH THEIR COMMITMENT WILL BE TESTED; THEREFORE, WE



HAVE DECIDED TO ELABORATE A LIST OF QUESTIONS WHICH HONEST AND TRUTHFUL ANSWERS, GIVEN BY OUR TEAM MEMBERS, WILL PROVIDE USEFUL INFORMATION.

ALSO, WE SHALL ADD THAT EACH IMPORTANT SUBJECT RELATED TO THE INTEGRATION OF AN iGEM TEAM WAS ADDRESSED IN THESE SET OF QUESTIONS.

ONCE WE SPOKE WITH THE TEAM MEMBERS, WE DECIDED TO ORGANIZE THE INFORMATION AND THE SUBJECTS AS IT FOLLOWS:

### 1. iGEM BACKGROUND

IN MOST CASES, STUDENTS HADN'T HEARD ANYTHING REGARDING iGEM COMPETITION. THERE ARE ONLY A FEW PEOPLE WHO'VE HEARD A FEW THINGS, SUCH AS THE PARTICIPATION OF FORMER MEXICAN TEAMS IN THIS COMPETITION.

### 2. FACTORS THAT INSPIRED TEAM MEMBERS INTO PARTICIPATING IN THIS COMPETITION.

A CONSTANT FOUND REGARDING THIS ASPECT IS THAT TEAM MEMBERS WANTED TO REPRESENT THEIR UNIVERSITY IN SUCH COMPETITION, THEY WERE CERTAIN THAT MEMBERS INTEGRATING THIS PROJECT WERE RESPONSIBLE AND WOULD PLAY AN IMPORTANT AND SIGNIFICANT ROLE INTO ACHIEVING THE SET GOALS. FURTHERMORE, STUDENTS WANTED TO APPLY THEORETICAL KNOWLEDGE INTO AN APPLICATION THAT WOULD BE USEFUL AND THAT WOULD ULTIMATELY BENEFIT MANKIND.

"WHEN I FIRST FOUND OUT THAT I COULD BE A MEMBER OF THIS TEAM, I WAS HIGHLY MOTIVATED, GIVEN THAT IT WOULD PROVIDE THE OPPORTUNITY TO PRACTICE THEMES MOSTLY SEEN IN THEORY, I WOULD BE ABLE TO DEVELOP, AND SEE OPPORTUNITIES BEYOND THE REACH OF THEORETICAL CLASSES. FURTHERMORE, IT IS A PROJECT DEVELOPED BY STUDENTS AND FOR STUDENTS."

### 3. ACQUIRED TECHNICAL SKILLS

WHEN IT COMES TO THE ACQUIRED TECHNICAL SKILLS MOST MEMBERS CONCLUDE THAT THEY HAVE DEVELOPED EXCELLENT SKILLS FOR PERFORMING COMMON PROTOCOLS USED FOR THIS COMPETITION, SUCH AS CHEMICAL TRANSFORMATION, PLASMID EXTRACTION, PCR PRODUCT PURIFICATION, AMONG OTHER COMMON PROTOCOLS, THEY EMPHASIZE THAT GIVEN THEIR PARTICIPATION, THEY WERE ABLE TO PERFECT THESE TECHNIQUES AND ACQUIRE A LOT OF EXPERIENCE IN THIS FIELD.

### 4. SKILLS THAT HELPED TEAM MEMBERS

EACH TEAM MEMBER HAS DIFFERENT SKILLS; THIS FACT ALLOWS THE ENRICHMENT AND INTEGRATION OF A SUCCESSFUL TEAM. SOME MEMBERS ADMIT THAT THEIR DETERMINATION, RESPECT TO OTHER PEOPLE'S POINT OF VIEW AND SKILLS TO ORGANIZE THEMSELVES WERE BASIC TOOLS THAT ALLOWED THEM TO CARRY OUT AN EXCELLENT JOB THROUGH THIS PROCESS. OTHERS ADMIT THAT THEIR SENSE OF RESPONSIBILITY, DISPOSITION TO COMPLETE THE ASSIGNED TASKS AND THE ABILITY TO AVOID CONFLICT BECAME THE TOOLS THAT HELPED THEM EXECUTE A GOOD JOB DURING THIS COMPETITION.

### 5. ABILITIES DEVELOPED DURING iGEM COMPETITION

MOST OF iGEM MEMBERS WHO WERE INTERVIEWED AGREE ON HIGHLIGHTING PATIENCE AND PERSEVERANCE AS TWO OF THE MOST IMPORTANT ABILITIES THAT iGEMERS LEARN TO WORK ON WHEN DEVELOPING THEIR PROJECT. IN ORDER TO UNDERSTAND THIS, IT HAS TO BE TAKEN INTO ACCOUNT THAT LAB WORK CAN BECOME REALLY LONG AND OVERWHELMING, AND THAT PROPER RESULTS MAY NOT BE REACHED BY THE DEADLINES ESTABLISHED BY THE TEAM; SO PATIENCE BECOMES A VITAL ABILITY WHEN FACING ALL THE TROUBLES DERIVED FROM SCIENTIFIC RESEARCH

AND EXPERIMENTAL VARIABILITY. SOME iGEMERS ALSO AGREE THAT A PROPERLY DESIGNED TIMETABLE MUST BE DEVELOPED FOR PROJECT SCHEDULES TO BE MET. WHEN DEALING WITH THE SETTING OF LABOR HOURS, IT IS IMPORTANT FOR LAB WORK TO BE DIVIDED EQUALLY BETWEEN TEAM MEMBERS.

THESE ABILITIES ARE USEFUL AFTERWARDS WHEN WORKING IN ANY SCIENTIFIC ENVIRONMENT, AS WELL AS IN NEARLY ANY ASPECT OF PROFESSIONAL LIFE. THUS, THERE IS NO DOUBT THAT PARTICIPATING AT iGEM COMPETITION POSITIVELY IMPACTS A VARIETY OF ABILITIES THAT MEMBERS HAD PREVIOUSLY NOT DEVELOPED.

"PATIENCE."

"OBTAIN THE ABILITY TO ORGANIZE MY TIME."

"[...] IT WAS HARD FOR ME TO WORK WITH SO MANY DIFFERENT PERSPECTIVES, BUT SINCE MY TIME IN iGEM, I WAS ABLE TO OVERCOME THIS DIFFICULTY.[...]"

### 6. IMPACT OF iGEM IN PERSONAL DEVELOPMENT

WHEN ASKED ABOUT THE WAY IN WHICH PARTICIPATING AT iGEM IMPACTED PERSONAL DEVELOPMENT, MOST OF THE TEAM MEMBERS SAY THAT IT HELPED THEM UNDERSTAND THAT THE RESULTS OF A PROJECT MAY NOT APPEAR BEFORE MONTHS OF WORK. THIS KNOWLEDGE, THOUGH SIMPLE, ACQUIRES A TOTALLY NEW DIMENSION WHEN COMBINED WITH EXPERIMENTAL WORK; BECAUSE NOW MEMBERS ARE CAPABLE OF REALISTICALLY ESTIMATING HOW LONG IT TAKES TO DEVELOP A VARIETY OF EXPERIMENTAL DESIGNS IN MOLECULAR BIOLOGY AND GENETIC ENGINEERING. iGEMERS ALSO AGREE WHEN SAYING THAT THROUGHOUT THE MONTHS THEY WORKED TOGETHER, THEY LEARNED HOW TO REACT TO UNEXPECTED ERRORS AND REDESIGN EXPERIMENTAL AND THEORETICAL PROCEDURES EFFICIENTLY. THIS IS AN ABILITY THAT IS EXPECTED FOR ANY SCIENTIST OR SCIENCE STUDENT.

"IT HAS HELPED ME TO BE PERSISTENT AND TO KNOW THAT REGARDLESS THAT THINGS DON'T ALWAYS GO AS YOU MAY WANT THEM TO, IT IS OF HUGE IMPORTANCE TO KEEP TRYING."

"NEVER GIVE UP"

"BEST POSSIBLE ATTITUDE."

### 7. REQUIREMENTS FOR A SUCCESSFUL TEAM WORK

TEAM MEMBERS INTERVIEWED WERE ASKED TO MENTION THE MOST IMPORTANT ASPECTS NEEDED IN A TEAM, SO THAT THE WORK OBJECTIVES COULD BE REACHED SUCCESSFULLY. AMONG SOME OF THESE ASPECTS STAND THE NEED OF WORKING TOGETHER, RATHER THAN INDIVIDUALLY; THE ESTABLISHMENT OF DEADLINES FOR SHORT TERM RESULTS, AND COMMUNICATION BETWEEN TEAM MEMBERS. SINCE iGEM PROJECTS ARE USUALLY LONG, IT IS EASY TO GET LOST WHILE TRYING TO FIGURE OUT WHEN TO DO EACH OF THE EXPERIMENTS REQUIRED; THIS IS EASILY AVOIDED ESTABLISHING DEADLINES, AND CAN BE MANAGED IN A MORE EFFICIENT WAY WHEN A GOOD ORGANIZATION BETWEEN TEAM MEMBERS EXISTS.

"DEVELOPMENT AND EXCELLENT RESULTS DEPEND ON US AS STUDENTS."

"LEADERSHIP, INDIVIDUAL AND TEAM COMMITMENT, EFFICIENT AND OBJECTIVE COMMUNICATION."

"BEING RESPONSIBLE, NEVER BACK DOWN, BEING PATIENT, BEING ANALYTICAL AND ABOVE ALL THIS, COMMITMENT IN THE REALIZATION OF THE EXPERIMENTAL WORK."

### 8. WHAT ARE THE MOST COMMON PROBLEMS AND MISUNDERSTANDINGS AMONG iGEM TEAM MEMBERS?

A VAST MAJORITY OF 2014 TEAM MEMBERS CONSIDER THE LACK OF CONFIDENCE TO BE THE MOST IMPORTANT PROBLEM INSI-



DE THE TEAM. SINCE iGEM TEAMS ARE USUALLY COMPOSED OF MORE THAN 10 MEMBERS, INTERACTIONS BETWEEN THEM TEND TO BE REDUCED TO LAB AND COMPUTER WORK; ALMOST ALL OF THE INTERVIEWED iGEMERS ASSURE THAT THEY DID NOT FEEL MOTIVATED TO PARTICIPATE IN A WORK ENVIRONMENT WHERE PEOPLE DID NOT TRY TO UNDERSTAND EACH OTHER IN ASPECTS OUTSIDE OF THE SCIENTIFIC AREA. THIS TROUBLE IS QUITE IMPORTANT, SINCE IT IS ABLE TO GREATLY REDUCE THE EFFICIENCY OF THE TEAM, AS WELL AS TO TURN iGEM INTO A RATHER HARSH EXPERIENCE.

IN TERMS OF EXPERIMENTAL WORK, SOME OF THE INTERVIEWED MEMBERS SAY THAT A LARGE FRACTION OF THE RESULTS DID NOT TURN OUT AS PLANNED, BECAUSE A LOT OF DEVIATIONS FROM THE PROTOCOLS AND PROCEDURES EXIST; THIS, BECAUSE MOST iGEMERS MODIFY THE EXPERIMENTAL CONDITIONS WITHOUT TAKING INTO ACCOUNT THE POSSIBLE CONSEQUENCES OF EACH TINY PART OF THE EXPERIMENTS THAT IS CHANGED.

FINALLY, COMMUNICATION ISSUES HAVE ALSO BEEN POINTED OUT AS ONE OF THE MAJOR TROUBLES AMONG iGEMERS. THIS IS ESPECIALLY TRUE WHEN PLANNING THE DEVELOPMENT OF LABORATORY WORK AND COMPUTER SIMULATIONS, BECAUSE A LARGE AMOUNT OF INFORMATION MUST BE UNDERSTOOD BY THE COMPLETE TEAM, AND THIS IS A DIFFICULT TASK, SINCE SUBGROUPS WORKING ON DIFFERENT AREAS OF THE PROJECT ARE USUALLY THE NORM.

"SOMETIMES THERE IS A PROBLEM OF COMMUNICATION, LEADING TO DELAYS IN THE DELIVERIES OF THE RESULTS."

## **9. WHAT COULD YOU AS A TEAM MEMBER DO IN ORDER TO SOLVE THESE PROBLEMS?**

IN ORDER TO SOLVE THE POTENTIAL TROUBLES STATED ABOVE, MOST INTERVIEWED TEAM MEMBERS AGREE TO ESTABLISH REGULAR MEETINGS WHERE DOUBTS AND SUGGESTION CAN BE MADE. THIS STRATEGY IS ABLE TO HELP IN SOLVING BOTH PERSONAL MISUNDERSTANDINGS BETWEEN iGEMERS, AND TECHNICAL PROBLEMS REGARDING LABORATORY AND PROJECT-SPECIFIC ISSUES. A LARGE NUMBER OF THE INTERVIEWED MEMBERS SUGGEST THAT EACH PERSON SHOULD ALWAYS BE WILLING TO BE INFORMED AND UNDERSTAND WHAT OTHER MEMBERS OR SUBGROUPS OF THE TEAM ARE WORKING ON, SO THAT THE PROJECT OBJECTIVES CAN ULTIMATELY BE ACHIEVED BY THE WHOLE TEAM.

AS FOR LABORATORY PROTOCOL BIASES, iGEMERS STRONGLY ENCOURAGE FUTURE MEMBERS TO STICK TO THE EXPERIMENTAL PROTOCOLS, SINCE THEY HAVE ALREADY BEEN REVISED AND GUARANTEE A LARGE PROBABILITY OF SUCCESS. IF ANY MODIFICATION SHOULD BE MADE, IT SHOULD FIRST BE REVISED AND APPROVED BY EXPERIENCED TEAM SUPERVISORS.

"CONSTANT WORK, ALWAYS BE CONSTANT."

"TIME, ONE MUST KNOW HOW TO ORGANIZE TIME; LOOSE FEAR TO FAIL; ALWAYS BEAR IN MIND WHAT YOU ARE DOING AND WHY."

## **10. WHAT COULD THE TEAM AS A WHOLE DO IN ORDER TO SOLVE THESE PROBLEMS?**

WORKING AS A TEAM, RATHER THAN AS A GROUP OF INDIVIDUAL SCIENTISTS OR RESEARCHERS. ABSOLUTELY ALL iGEMERS WHO WERE INTERVIEWED ENCOURAGE FUTURE MEMBERS TO ALWAYS TRY TO UNDERSTAND THAT TEAM MEMBERS ARE EQUAL AND SHOULD BE CONCERNED OF WHAT IS GOING ON WITH OTHER MEMBERS. THIS KIND OF RELATIONSHIP IS ABLE TO POSITIVELY AFFECT THE TEAM, AND BOOST THE ACHIEVEMENT OF SUCCESSFUL RESULTS.

## **11. WHICH WERE THE MOST IMPORTANT DECISIONS THAT**

## **GUARANTEED THE SUCCESS OF THE TEAM?**

TWO ANSWERS WERE REPEATED BY ALL THE INTERVIEWED PARTICIPANTS: ON THE FIRST HAND, CHOOSING THE SCOPE OF THE PROJECT, AND, ON THE SECOND HAND, SUBDIVIDING THE TEAM IN GROUPS THAT WERE RESPONSIBLE OF SPECIFIC OBJECTIVES. SELECTION OF THE PROJECT'S THEME IS DEFINITELY A CRUCIAL DECISION FOR EACH AND EVERY iGEM TEAM, SINCE IT IS THE MOMENT WHEN THE MEMBERS AGREE TO WORK ON A SPECIFIC PROBLEM FOR THE REST OF THE COMPETITION, WHICH USUALLY LASTS MORE THAN 8 MONTHS. IF AT THIS STAGE OF THE PROJECT, ANY DISAGREEMENT EXISTS, IT WILL BECOME VERY DIFFICULT TO MANAGE TO WORK AS A TEAM THE REMAINING TIME. IT IS, THEN, QUITE IMPORTANT THAT ALL TEAM MEMBERS ARE WELL INFORMED NOT ONLY ABOUT THE GENERAL IDEA AND OBJECTIVES OF THE PROJECT, BUT ALSO ABOUT ITS LIMITATIONS AND ALL THE ASPECTS IT IMPLIES.

AS FOR THE SECOND ANSWER, TEAM'S SUBDIVISION, IT IS A COMMON STRATEGY AMONG iGEMERS AND MOST OF THEM AGREE IN TELLING THAT IT IS VITAL TO ACHIEVE SUCCESSFUL RESULTS. THIS, BECAUSE IT IS MORE DIFFICULT FOR THE TEAM MEMBERS TO TRY TO WORK IN ALL AREAS OF THE PROJECT AT THE SAME TIME, RATHER THAN FOCUSING ON A SPECIFIC TASK AND ANALYZING ALL THE ASPECTS OF IT.

## **12. WHICH ASPECTS SHOULD BE CONSIDER IF THE TEAM WANTS TO OBTAIN SUCCESSFUL RESULTS?**

AMONG THE MOST FREQUENT ANSWERS TO THIS QUESTION IS THE PROPER PLANNING OF THE PROJECT. IF THE EXPERIMENTAL WORK IS PLANNED PROPERLY, POSSIBILITIES OF REACHING THE DESIRED GOALS ARE HIGHER. SOME OF THE INTERVIEWED ALSO SAY IT IS IMPORTANT TO PROPERLY FOLLOW THE EXPERIMENTAL PROCEDURES, IN ORDER TO AVOID UNEXPECTED TROUBLES OR DELAYS. FINALLY, iGEMERS ALSO SAY THAT IT IS IMPORTANT THAT ALL MEMBERS BE INFORMED OF THE TEAM DECISIONS AND OF ANY ADVANCE IN THE RESULTS.

## **13. WOULD YOU REPEAT THE iGEM EXPERIENCE?**

THE MAJORITY OF iGEMERS ANSWERED YES TO THIS QUESTION, MAINLY BECAUSE OF THE PROFESSIONAL EXPERIENCE AND CHALLENGE IT REPRESENTS. HOWEVER, THERE IS ALSO A FRACTION OF INTERVIEWED MEMBERS WHO SAY THEY WOULD EITHER NOT REPEAT THE EXPERIENCE, OR NOT IN THE CLOSE FUTURE. WHETHER PEOPLE ENJOY OR BEING PART OF AN iGEM TEAM DEPENDS ON A VARIETY OF FACTORS SUCH AS THEIR ROLE WITHIN THE TEAM, HOW WELL THE MEMBERS GET ALONG, AND THE OVERALL RESULTS OF THE PROJECT.

## **14. DO YOU CONSIDER YOUR TEAM TO BE PREPARED FOR THE EVENT AT BOSTON? IF NOT, WHAT IS MISSING?**

SURPRISINGLY, MOST OF THE INTERVIEWED MEMBERS DO NOT FEEL PREPARED TO PRESENT THEIR PROJECT AT BOSTON. EVEN THOUGH SOME OF THE ANSWERS OBTAINED SAY THAT THE TEAM IS PSYCHOLOGICALLY PREPARED, AND SOME RESULTS WERE PERFECTLY OBTAINED, TEAM MEMBERS DO NOT GENERALLY FEEL COMFORTABLE WITH PRESENTING THE OBTAINED RESULTS. THIS IS MAINLY BECAUSE OF TWO REASONS: FIRSTLY, THE OBTAINED RESULTS ARE USUALLY NOT THE ONES EXPECTED AT THE BEGINNING OF THE PROJECT, THIS BECAUSE iGEM PROJECTS ARE USUALLY LONG AND, SINCE TEAM MEMBERS ARE UNEXPERIENCED SCIENTISTS, IT TAKES LONGER THAN PLANNED TO ACHIEVE THE TEAM'S GOALS. SECONDLY, SOME iGEMERS SAY THAT THEY HAVE SEEN HOW SOME MEMBERS ARE NOT WELL INFORMED IN ALL THE AREAS OF THE PROJECT, AND THIS SHOULD BE CORRECTED BEFORE TRAVELLING TO BOSTON.



## 8. BIG THANKS

AS PART OF AN ENTRUSTED COLLABORATION BETWEEN TWO 2014 iGEM TEAM PARTICIPANTS, VIRTUS-PARVA AND ITESM-CEM, THE SCRIPTING OF THESE HANDBOOKS WAS ACHIEVED. STILL, A BIG PIECE OF THIS HANDOUT WAS THE FOLLOW UP OF A PREVIOUS AND VERY COMPLETE WORK PERFORMED BY WAYNE MATIERI, OF THE 2008 EDMONTON TEAM, HIS WAS THE STEPPING STONE TO THE EDIFICATION OF A GROUP OF GUIDES THAT, IT IS IN THE BEST OF OUR HOPES WILL BE OF GREAT AID TO ALL THOSE WHO MIGHT REQUIRE, AND IMPROVE IT. BUT MOST OF ALL, I THANK YOU, THE FUTURE GENERATIONS OF iGEMERS WHOSE COURAGE KEPT YOU READING ALONG THE PAGES, AND WHOSE IDEAS WILL HELP RESHAPE THE GLOBE!

